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## **HUMAN CAPITAL OBJECT (HCO) AND SKILLOBJECT™ BASED MANPOWER, PERSONNEL & TRAINING ANALYSES**

### **ABSTRACT**

Department of Defense (DoD) 5000.2 acquisition reforms, coupled with capabilities-based force, training and readiness transformation initiatives, are driving changes to the Human Systems Integration (HSI) paradigm and Human Performance (HP) considerations. Also, the Chief of Naval Operations' (CNO) new Future People Strategy focuses on a competency (skills) based workforce to sustain a personnel-effective and affordable warfighting force.

Subsequently, Navy Manpower, Personnel and Training (MPT) requirements processes need to be linked to these DoD, Joint and Navy transformation and personnel initiatives to provide a capabilities- and competency-centric force. The Navy Sea Warrior Total Force Readiness (TFR) concept, with its Human Capital Objects (HCO) and SkillObjects™ (SO), can help facilitate this alignment, as demonstrated by the Naval Air Systems Command (NAVAIR) MPT approach for the 2005 Littoral Combat Ship / Next Generation Destroyer LCS/DD(X) Alternative Aviation Support (AAS) Study for shipboard Aviation Detachments (AVDET). Of equal importance to accomplish this, was a multi-disciplined HSI (MPT) analysis team led by the NAVAIR 1.2 Aviation-Ship Integration Team, involving NAVAIR HSI and training development communities with the CNO's HSI / Manpower office. This paper describes the AAS Study MPT Team's capabilities- and competency-based approach to incorporate TFR principles for skills-based MPT requirements analyses and findings for further application by Navy HSI practitioners. It specifically focuses on aviation HCO SO based training requirements as the analytic precursor to follow-on Aviation-Ship integrated, skills-based MPT assessments with TFR HCO positions and SO tasks.

### **1. INTRODUCTION**

The Navy's LCS and DD(X) acquisition programs tasked NAVAIR 1.2, from an MPT perspective, to conduct AAS Study analyses to reduce the AVDET manning footprint when deployed on the LCS and DDX. As a result, several unique goals/constraints were addressed:

- a. Assessing of an aviation manpower footprint for a composite AVDET of manned and unmanned aircraft within LCS and DD(X) design-driven manning constraints.
- b. Incorporating Navy TFR principles with Sea Warrior architecture to demonstrate a skills-based approach to MPT analyses for a future competency-based aviation workforce.
- c. Leveraging the LCS Top Down Requirements Analysis (TDRA) Report to evaluate a mission/task (capabilities) centric AVDET manning concept to initially support the NAVAIR TFR goal to link Commanders' Warfighting Capabilities to Missions to Navy Mission Essential Tasks Lists (NMETLs) to Skill Sets and Performance Standards.

## 2. BACKGROUND

Navy LCS and DD(X) programs requested a study identifying innovative aviation support concepts that could reduce an AVDET manpower footprint for deployment. The NAVAIR 1.2 MPT Team facilitated this determination via aviation MPT analytic solutions through Navy TFR and Revolution in Training goals to achieve a 50% reduction in AVDET organizational manning.

### 2.1 JCIDS for Mission Capabilities-based MPT Requirements

Figure 1, Missions Requirements for Optimal Human Performance, depicts the core relationship of mission requirements to system-specific HSI requirements. Integration of mission needs into HSI (MPT) requirements determination can be accomplished with a Mission Analysis and a Mission Essential Task List (METL). This allows HSI practitioners to derive mission-capable MPT requirements for new acquisition and upgraded legacy systems, plus identify mission-ready MPT resources for Combatant Commanders' warfighting organizations through optimizing HP.

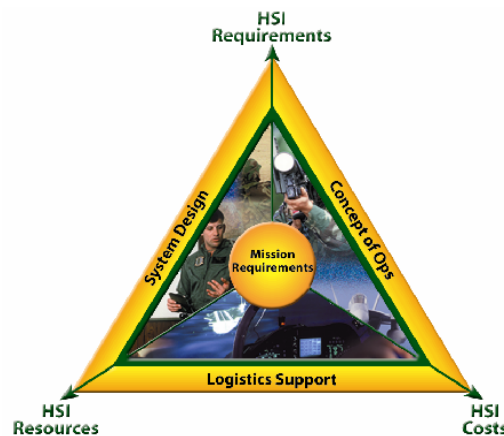


FIGURE 1. Mission Requirements for Optimal Human Performance

Navy METLs (NMETLs) derived through the Joint Capabilities and Development System (JCIDS) process provide the foundation to assess HP and MPT requirements from force and system-specific perspectives. NMETLs are the total force link to support Navy's transformation efforts and for the application of capabilities-focused (mission/task based) MPT assessments. JCIDS capabilities-based products provide force-wide Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) solutions to improve mission readiness.

Further, capabilities and competency-focused MPT solutions can be achieved using today's mission/skills-based tools, methods and data with the Navy's Sea Warrior architecture and TFR principles. As an example, the AAS Study conducted a mission/task-based manpower excursion that demonstrated an analytic approach with LCS TDRA data to derive capabilities-focused manpower aligned to LCS warfighting mission requirements.

### 2.2 Navy LCS and DD(X) Ship Descriptions

This paragraph contains summary descriptions of the LCS and DD(X) Programs and Navy personnel-related force management issues that TFR principles are helping to address.

### 2.2.1 Littoral Combat Ship - LCS

LCS is envisioned as a networked, agile, stealthy surface combatant capable of defeating anti-access and asymmetric threats in the littorals. It will complement the Navy's Aegis Fleet, DD(X) and CG(X) by operating in environments where it is less desirable to employ larger, multi-mission ships. The LCS is intended to fill capability gaps in the littoral mine warfare (MIW), surface warfare (SUW) and anti-submarine warfare (ASW) missions. For the LCS/DD(X) AAS Study, five AVDET operational scenarios were assessed to accomplish these missions when utilizing a mix of MH-60S, MH-60R and Fire Scout VTUAV platforms.

### 2.2.2 Next Generation Destroyer - DD(X)

DD(X) is the centerpiece of a Family of Ships to deliver a vast range of war fighting capabilities to maximize and revolutionize Fleet combat capability. It will be a multi-mission surface combatant and precision strike and volume fires provider within the Navy's family of surface combatants. DD(X) is focusing on risk mitigation of transformational technologies for the Surface Fleet, as a baseline for spiral development of technology and engineering to support a range of future ship classes, such as CG(X), LHA(R) and CVN-21. An ADVET construct with the same LCS mix of manned and unmanned aviation platforms was used for DD(X).

### 2.3 Total Force Readiness - TFR

The 2004 Department of the Navy Human Capital Strategy publication describes the Navy's efforts to implement a human capital management strategy (now termed TFR), to ensure it is properly aligned with the missions in *Naval Power 21*, *Sea Power 21*, and *Marine Corps Strategy 21*. The TFR process addresses three critical, emerging issues:

- 1) Resources required for modernizing naval forces;
- 2) Introduction of new technologies into the workplace; and
- 3) Effect of trends in the workforce driven by demographics and changing dynamics.

TFR is a process to align work requirements to positions (e.g., billets) and, with personnel SOs and Knowledge, Skills and Abilities (KSAs), help derive a skills-based workforce for HSI practitioners. The Navy Manpower Analysis Center (NAVMAC), Naval Personnel Development Command (NPDC) and the Center for Naval Aviation Technical Training (CNATT) are currently in the process of officially defining aviation maintenance HCOs and SOs. Table 1 provides HCO and SO definitions as used for the AAS Study.

**TABLE 1. HCO and SO Definitions**

HCS Term	Definition
Human Capital Object	Multifaceted collection of work and workplace data content requirements in a specific environment or set of environments that will be used to support manpower, training and HSI analysis. An HCO is comprised of SkillObjects™.
SkillObject™	Observable occupational skill containing Unique Knowledge, Skills, Abilities, Tools, Tasks and Resources (KSATTR) at the job level and context work elements (e.g., context identifier, specialty knowledge, skills and abilities [KSA], sub-tasks, procedures, etc.) where applicable.

### 3. LCS/DD(X) AAS STUDY MPT METHODOLOGY

To derive LCS and DD(X) AVDET MPT resources, the following methodology was utilized. Emphasis was placed on identifying maintenance requirements, e.g., system workload-driven parameters, and assessing the feasibility of identifying HCO SO based MPT resources and the impacts on an AVDET's ability to perform missions within LCS and DDX manning constraints.

Figure 2, Aviation Mission/Task-Centric HSI Analysis with Sea Warrior, depicts the overarching AAS Study MPT analytic approach. Key for a capabilities-based approach to system and organizational MPT requirements is Step 1 - Leverage Mission-Task Analyses. Thus, the Study MPT Team used the 2004 LCS TDRA Report which documented total ship tasks and workloads (Core Crew, Mission Module and AVDET) based on the LCS missions and associated NMETLs.

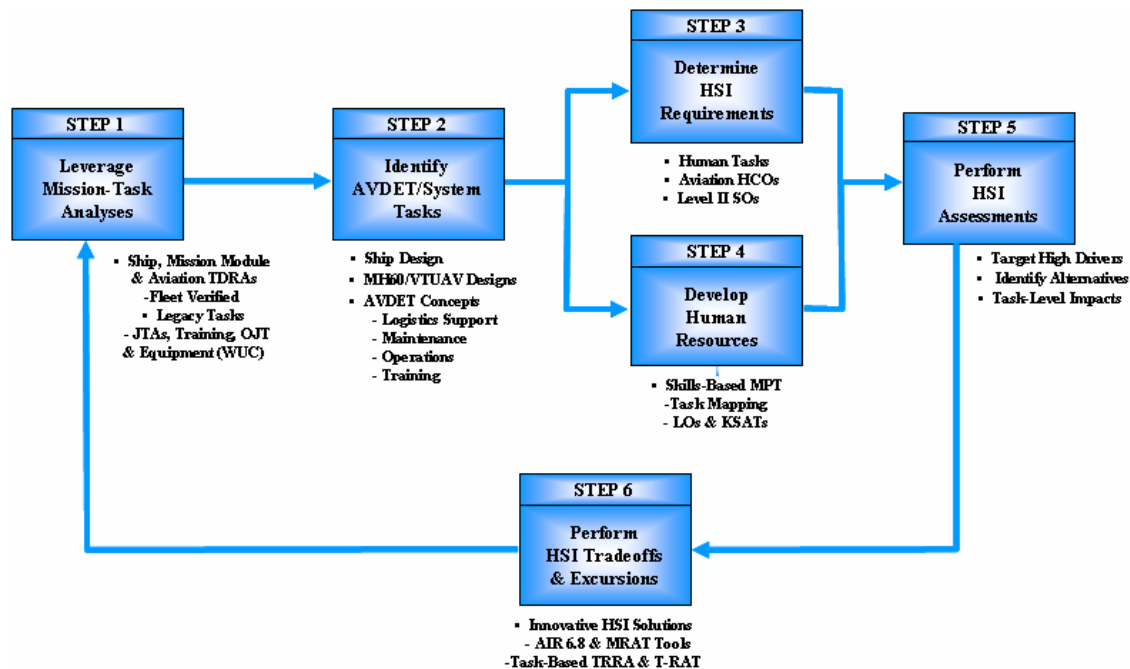


FIGURE 2. Aviation Mission/Task-Centric HSI Analysis with Sea Warrior

#### 3.1 Manpower and Personnel Analysis

The AAS Study used the standard NAVAIR manpower requirements determination process with system operational concepts to derive five AVDET manpower baselines. The Study MPT Team refined AVDET job and workload (workforce) structure to support HCO-driven positions and associated skill sets with SO tasks. This optimized AVDET manning by assessing maintenance workloads and maximizing available productive time by work center position. This effort also facilitated the redistribution of SOs to provide examples of hybrid aviation maintainers.

An analysis excursion was conducted with LCS TDRA Report data (mission-based aviation tasks/workloads) supplemented with organizational maintenance data from the Naval Aviation Logistics Data Analysis (NALDA) program. It was evaluated as a potential means to eventually optimize and align AVDET manning to Combatant Commanders' mission needs. It may eventually support the NAVAIR 1.2 2006 CVN-21 aviation manpower reduction analysis with its 2020 Air Wing and CVN-21 aviation intermediate maintenance and supply departments.

CNATT provided HCO and SO Task source data to develop skills-based AVDET personnel requirements. CNATT's HCO-driven positions and skill sets also supported the development of a sample HCO-based AVDET training track through alignment of SO tasks with training course task lists. The Team coordinated with the Center for Surface Combat Systems (CSCS) to ensure the LCS AVDET HCO application would be consistent with Core Crew and Mission Module HCO assessments for comparable MPT-related work elements from a total ship perspective.

Thus, the Navy's system acquisition and HSI communities need to be fully cognizant of the need to develop a skills-based workforce and supporting MPT resources in accordance with (IAW) the CNO's Future People Strategy. Specifically, the use of TFR principles with the Sea Warrior architecture and HCO and SO requirements to define workforce positions with the necessary personnel skill sets to support the Navy's future force..

### 3.2 Training Resource Requirements Analysis - TRRA

Utilizing guidelines and procedures from the Navy Training Planning Process Methodology (TRPPM), an initial approach for an LCS/DD(X) AVDET training analysis process was developed. Key to the developing this process was the understanding that an AVDET TRRA would require a task-level evaluation of aviation personnel HCO positions using SO tasks by Rating/NEC. Level I tasks would provide enlisted training tracks at the course module level, with SO Level II tasks (when available) providing source data for training tracks with a SO linkage to Learning Objectives (LO). NAVAIR's Training Systems Division (TSD) coordinated this process with the MPT Team using the following analytic logic flow:

- Identify legacy and predecessor systems (SH-60B, HH-60H, etc.) training pipelines.
- Compare HCO SO data with legacy training courses and task lists by Rating/NEC.
- Perform an impact assessment on aviation training tracks sequencing and resources for HCO-based AVDET personnel requirements.
- Develop a baseline TRRA approach to be eventually employed with SO Level II tasks and future HCO-driven manpower analysis products.

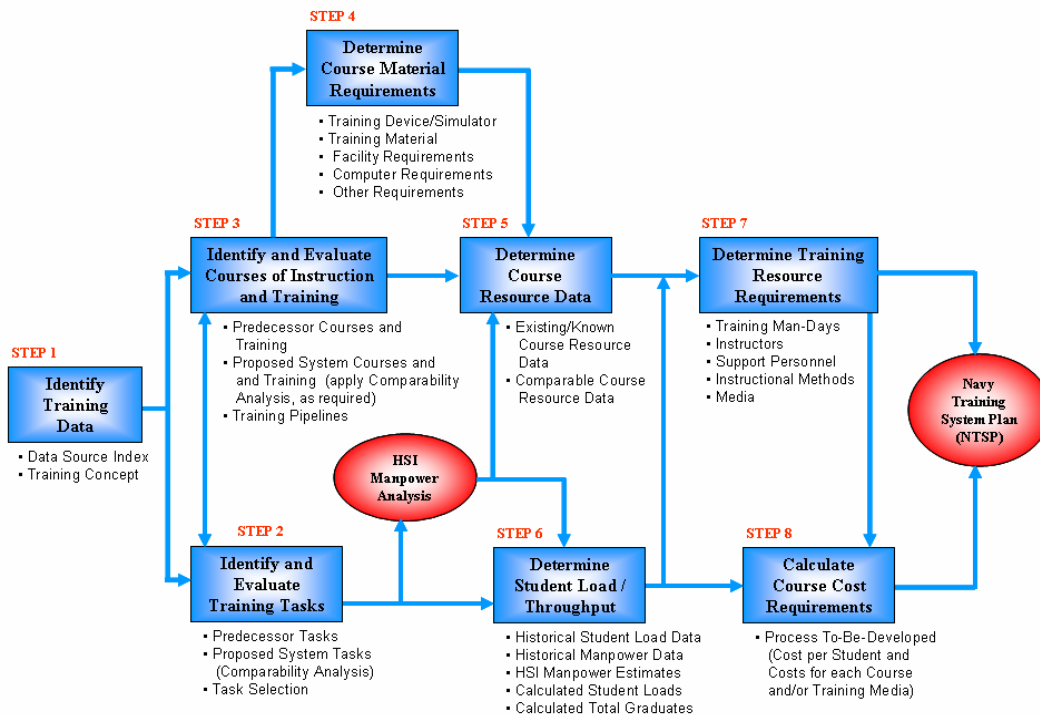
Figure 3 depicts proposed HCO-SO-based TRRA approach utilizing comparability analysis techniques with legacy and predecessor system course and task data to estimate new system (i.e., MH-60R/S) requirements. These techniques were based on validated TRPPM procedures and the NAVAIR TSD TRRA process.

For HCO-based TRRA development, an assessment of LCS HCO SO task data and related Training Course Control Documents (TCCD) (i.e., syllabi) and Course Training Task List (CTTL) information was performed. AAS Study constraints limited this to an example of HCO SOs for the Aviation Ordnanceman (AO) Rating. Aviation HCO SO data development also resulted in several "strawman" processes for training analyses, with the most effective using alignment of aviation HCO SO tasks to course training tasks.

The Navy's HCO Governing Board had recommended using Learning Objectives (LO) as a means of connecting SOs to course/training content. CTTL tasks were selected over LOs as the more accurate means (currently) to connect SO tasks to course content. This was based on several considerations:

## HUMAN CAPITAL OBJECT (HCO) AND SKILLOBJECT™-BASED MPT ANALYSES

- 1) Assumption that Level II SO tasks (when developed) will align well to CTTL tasks,
- 2) Data for HCO SO Performance Standards was not yet available, and
- 3) CTTL tasks to course content connectivity (i.e., Lesson Topics) was more precise.



**FIGURE 3. Proposed HCO SO-Based TRRA Process**

As noted in Figure 4, HCO SO tasks were aligned with legacy (equivalent AO Rating) CTTL tasks and the tasks' Lesson Topics and course content. This alignment is in accordance with NAVEDTRA 130A, "Task Based Curriculum Development Manual". Course content and training resources data available from CTTL alignment to TCCD lessons include: training sequence and time; instructional method and media; student to instructor ratio; and class size.

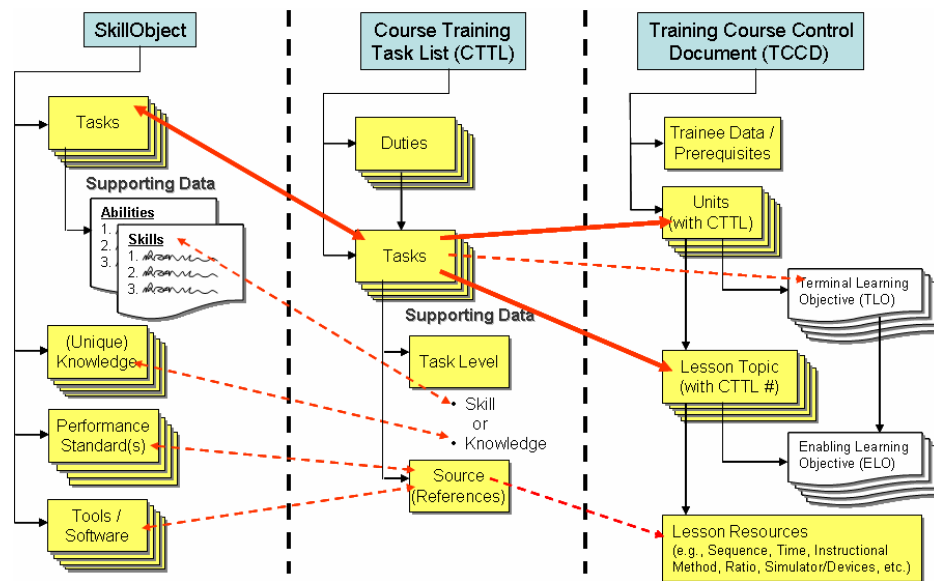
Using LCS HCO SO tasks for AVDET AO Rating positions and associated CTTL and TCCD was not straight forward. Several factors hindered this alignment:

- Existing training task lists were developed by different analysts and organizations.
- Task statements were written based on guidelines for different Task Levels (i.e., I, II, and III). LCS AVDET HCO SO tasks were generally written to Level I, while CTTL tasks approximated Level II data.

Note: CNATT aviation HCO SO Level I task data was to be updated to Level II after the delivery of the 2005 LCS DD(X) AAS Study Report.

- Not all CTTL tasks comply with guidelines in the NAVEDTRA 130A series or Military Handbook (MIL-HDBK) 29612-2A, "Instructional Systems Development / Systems Approach to Training and Education".

By calculating the training resources associated with all CTTL tasks that align to a specific SO tasks, it was possible to accurately estimate the training resources required to train the SO tasks.



**FIGURE 4. Relationship of HCO SO Tasks to CCTL and Course Content**

In determining the training requirements of a SO (including all tasks), a training analyst must ensure that required training resources are not double-counted. This situation can occur whenever CTTL tasks align with multiple SO tasks. Thus, the double-counting of training resource requirements is best verified by the respective training/curriculum subject matter experts (SME). -- Totalling all SO training resource requirements (after eliminating duplication of training across SOs) can provide an accurate training resource requirements estimate (in training time and materials) for individual HCOs.

## 4. FINDINGS AND CONCLUSIONS

The LCS/DD(X) AVDET MPT analysis successfully demonstrated a practical approach to develop system and organizational MPT resources aligned with DoD acquisition reforms and Navy transformation initiatives to include TFR objectives. The AVDET MPT analysis process provides a foundation for follow-on development of capabilities- and competency-based Navy human resources. The AAS Study analytic approach can also help enhance human performance (HP) within the Navy's future force when LCS and DD(X) platforms are introduced to the fleet. Thus, an underlying goal of the AAS Study was to provide insights to aviation decision-makers and LCS and DD(X) program managers on optimal AVDET MPT performance parameters that could ensure system warfighting mission readiness.

The AAS Study MPT Team also made a focused effort to understand the future structure of the Navy's workforce. The Team's application of HCOs and SOs for HCO-based AVDET positions with the requisite skills using SO tasks with the associated KSAs could result in a competency-based workforce described by the CNO's Future People Strategy. Thus, the LCS/DD(X) AAS Study MPT analysis also provides insights on how acquisition program managers and HSI practitioners can potentially help derive both an operational and personnel effective Navy force.



Given the Study focus on HCO SO training as the precursor to Aviation-Ship integrated, skills-based MPT assessments, the related findings and conclusions are:

1. HCO SO Tasks can effectively be aligned to training tasks, e.g., CTTL tasks and tasks from the Wing's On-the-Job-Training (OJT) syllabi.
2. Aligning HCO SO tasks to CTTL and course content (i.e., TCCD), makes it possible to accurately estimate Training Resource Requirements for training time, class sizes, train/no-train and instructional setting decisions, instruction methods and media, and training material requirements, including training simulators/devices.
3. Alignment of HCO SO tasks with existing Level II tasks, e.g., Wing OJT tasks, with Work Unit Codes is possible and could support skills-based manpower estimation.
4. A technical analytic approach has been identified to further evaluate for HCO-based MPT resource requirements determination IAW TFR principles.

## 5. SUMMARY WITH RECOMMENDATIONS

Follow-on NAVAIR MPT studies need to use TFR principles to align warfighting capabilities to missions to NMETLs to skill sets and performance standards. These should be based on the Sea Warrior architecture and should include a complete set of HCOs and SOs for LCS and DD(X) AVDET work centers and SO-based training tracks. There is also a need to leverage emerging mission-task decomposition analyses for LCS, DD(X) and assigned aviation platforms. The goal would be aviation MPT resources to support the CNO's Future People Strategy while providing Combatant Commanders with a mission-ready aviation workforce. Key recommendations are:

1. Develop and refine the LCS/DD(X) AVDET HCO SO process and supporting techniques for estimating system-specific student throughputs and training cost estimates.
2. Validate and apply aviation HCO SO-based processes that support manpower estimation. These are currently under review for future CVN-21 and 2020 Air Wing manpower / personnel analyses. Figure 5, Proposed HCO SO-Based Manpower Analyses Process, depicts the process employing alignment of HCO SO tasks with Naval Aviation Logistics Command Management Information System (NALCOMIS) data.

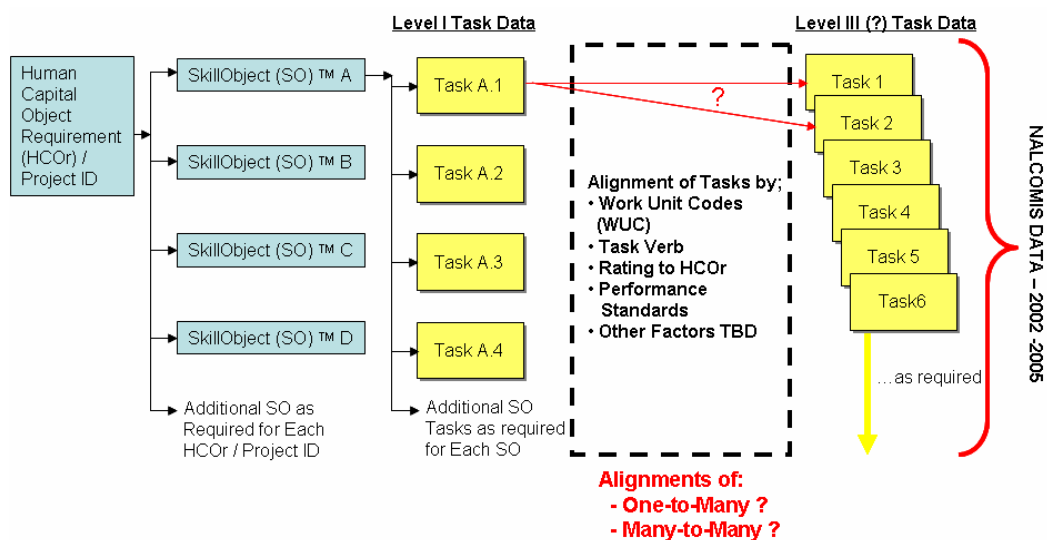


FIGURE 5. Proposed HCO SO-Based Manpower Analyses Process



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